

REMARKS

The following remarks are being submitted as a full and complete response to the Office Action dated November 13, 2009. In view of the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

As outlined above, claims 1, 2, 6-8, 12, 13, and 17-22 stand for consideration. It is respectfully requested that all pending claims be reconsidered and found allowable based on the following.

Formal Rejections: 35 U.S.C. § 103

Claims 1, 2, 6-8, 12, 13, and 17-22

Claims 1, 2, 6-8, 12, 13, and 17-22 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Barna, *et al.* (U.S. Patent No. 6,611,235) (hereinafter “Barna”), in view of Onaka, *et al.* (U.S. Patent No. 6,600,449) (hereinafter “Onaka”). In the rejection, it was alleged that Barna discloses a plurality of transmission lines having a plurality of frequencies. The Examiner acknowledges that Barna does not disclose that the respective lengths of the plurality of transmission lines are set so that impedance matching is performed at a feeding point with respect to the plurality of frequencies or the claimed total length of transmission lines. However, it was alleged that Onaka discloses respective lengths of a plurality of transmission lines are set so that impedance matching is performed at the feeding point, with respect to the plurality of frequencies. Further, although the Examiner acknowledges that Barna and Onaka do not disclose a total length of the plurality of transmission lines is shorter than the sum of a quarter wavelength of an electromagnetic wave of the first frequency and half wavelengths of electromagnetic waves of the second, third and fourth to n-th frequencies, the second, third and fourth to n-th frequencies being higher than the first frequency, it was alleged that the difference would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the electrical length of the transmission lines to obtain desired frequency bands based on particular application or environment of use.

Contrary to the rejection, Applicants respectfully submit that the claims are not obvious from Barna, in view of Onaka. As an initial point, Applicants have already successfully traversed the rejection to the claims as being obvious from Barna, in view of Onaka, in the June 26, 2008, Amendment in response to the March 26, 2008, Office Action. Moreover, one of ordinary skill in the art would not have been lead to modify the individual or combined disclosures in order to arrive at the claimed relationship between the total length of transmission lines and radiating electromagnetic waves.

Referring specifically to the June 26, 2008, Response successfully traversing the obviousness rejection to the claims based on Barna, in view of Onaka, the present antenna, having the recited lengths of the plurality of transmission lines, results in electromagnetic waves being radiated from the transmission lines constituting the antenna at respective frequencies in a non-local manner. As a result, unlike the multi-mode antenna of the prior art, a specific transmission line of the present device contributes to radiation commonly with respect to plural frequencies. Further, the presence of this common portion contributes positively to a reduction in the overall length or dimension of the current pathway conductor portion of the multi-mode antenna contributing to the radiation. Accordingly, due to the short overall length or dimension of the current pathway as compared with that of a multi-mode antenna in the prior art, the bandwidth can be expanded in the antenna according to the present invention.

In contrast to the present invention, Barna discloses an antenna wherein an electromagnetic wave is radiated into free space in a non-local manner in each of the frequency bandwidths in which the antenna is to be operated. However, Barna fails to disclose, teach or makes obvious any relationship between the total length of transmission lines used in the antenna and frequency (wavelength) of a radiated electromagnetic wave, as recited in the claims. Further, as will be discussed more below, Onaka fails to recognize, teach or in any way make obvious the relationship between the total length of the transmission lines and the frequency (wavelength) at which an antenna operates. Thus, contrary to the Examiner's assertion, on page 4 of the Office Action, that one would have found it obvious to vary the total length of the plurality of transmission lines to obtain a desired frequency, thereby arriving at the claimed lengths. Applicants respectfully submit that there fails to be any support in the art, let alone the art cited for such an assertion. Therefore, the present invention as a whole is distinguishable and thereby allowable over Barna by itself and in view of Onaka.

The secondary reference of Onaka discloses in column 4, lines 36-57, an antenna that radiates electromagnetic waves of plural frequencies, but whose operating principle differs substantially from that of the present invention. Since each radiating element contributes to electromagnetic wave radiation individually, an electromagnetic wave is radiated into free space in a local manner in each of the frequency bandwidths in which the antenna is to be operated. Thus, the basic operating principle of Onaka differs not only from the present invention, but also from that of Barna. Accordingly, the combination of Barna and Onaka fail to make the claimed antenna obvious.

Moreover, Applicants respectfully submit that, due to technical differences, one of ordinary skill in the art would not combine Barna with Onaka, as these references contradict each other. It is a well known principle that a rejection based on prior art references that contradict or teach away from each other is improper. *(It is well-settled that the mere fact that the prior art can be modified should not have made the modification obvious unless the prior art suggested the desirability of the modification, and that a modification which would render the prior art apparatus inoperable for its intended purpose does not establish a prima facie case of obviousness.)* *In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984) (citing *In re Imperato*, 179 U.S.P.Q. 730, 732 (CCPA 1973) and *In re Schulpen*, 157 U.S.P.Q. 52, 55 (CCPA 1968); *[w]here the prior art teaches away from the claimed invention, it cannot render the claimed invention obvious. Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 230 U.S.P.Q. 416, 420 (Fed. Cir. 1986); *In re Gordon*, 221 U.S.P.Q. 1125, 1127 (Fed. Cir. 1984)).

Neither Barna nor Onaka discloses or makes obvious an antenna in which an electromagnetic wave is radiated into free space in a non-local manner in each of the frequency bandwidths in which the antenna is to be operated and relation between the total length of transmission lines used in the antenna and frequency (wavelength) of a radiated electromagnetic waves. In other words, using claim 1 as an example, these references, either individually or even in combination, do not show or suggest any structure or operation for the combination of a ground conductor having a ground potential; a single feeding point whose one end is formed by a part of the ground conductor; and a plurality of transmission lines to which RF power supplied to the feeding point is input, for radiating electromagnetic waves of a plurality of frequencies into space, wherein the plurality of transmission lines include a transmission line for radiating electromagnetic waves of the plurality of frequencies commonly into space, impedance matching

is performed at the feeding point with respect to the plurality of frequencies, and when the plurality of frequencies are composed of n frequencies of first, second, third and fourth to n-th frequencies, where n is a positive integer of two or more, the total length of the plurality of transmission lines is shorter than the sum of a quarter wavelength of an electromagnetic wave of the first frequency and half wavelengths of electromagnetic waves of the second, third and fourth to n-th frequencies, the second, third and fourth to n-th frequencies being higher than the first frequency. As such, these references cannot anticipate or render obvious each and every feature of the present invention as claimed.

Furthermore, prior to the present invention, one of ordinary skill in the art would not have had any apparent reason to modify the lengths of the plurality of transmission lines of Barna, let alone to have the very specific lengths, as claimed. Although it was alleged that one of ordinary skill in the art would determine the electrical length of the transmission lines to obtain desired frequency bands based on a particular application or environment of use, neither Barna nor Onaka provide any instruction which would lead one of ordinary skill in the art to modify the lengths. Although it was alleged that one skilled in the art would have found it obvious to determine the electrical length of the transmission lines to obtain the desired frequencies, prior to the present invention, the relationship between total length and frequency was unknown. Therefore, one of ordinary skill in the art would not have recognized any benefit from varying the total length of the transmission lines or frequency. Accordingly, there fails to be any teaching or any disclosure within the cited prior art references which would allow one of ordinary skill in the art to know that the very specific lengths have any advantage or benefit. Therefore, one of ordinary skill in the art would not know to modify the lengths of the transmission lines or the total length of the transmission lines to arrive at the claimed lengths. Moreover, as discussed above, prior to the present invention, one of ordinary skill in the art, from Barna, would not be lead to modify the lengths of the plurality of transmission lines, in view of Onaka, as one would not have known that modifying the lengths would provide any benefit or advantage. Therefore, the combination of disclosure of Barna, in view of Onaka, fails to enable one of ordinary skill in the art to know to modify the modify the total length of the plurality of transmission lines to arrive at the claimed length.

Based on the foregoing, Applicants respectfully request that the rejection to the claims under 35 U.S.C. § 103(a) be withdrawn.

Conclusion

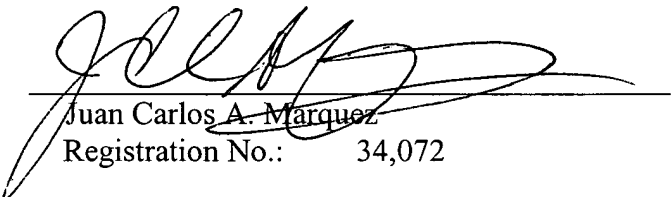
In light of the foregoing Remarks, Applicants respectfully request early and favorable action with regard to the present application, and a Notice of Allowance for all pending claims is earnestly solicited.

Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and telephone number indicated below.

Respectfully submitted,

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